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Mercury compositional units inferred by MDIS. A comparison with the geology in support to the BepiColombo mission

Francesca Zambon (1), Cristian Carli (1), Valentina Galluzzi (1), Fabrizio Capaccioni (1), Gianrico Filacchione (1), Lorenza Giacomini (2), Matteo Massironi (2), and Pasquale Palumbo (1)

(1) INAF - IAPS, Roma, Italy (francesca.zambon@iaps.inaf.it), (2) Dipartimento di Geoscienze, Padova University, Padova, Italy

Mercury has been explored by two spatial missions. Mariner 10 acquired 45% of the surface during three Hermean flybys in 1974, giving a first close view of the planet. The recent MESSENGER mission globally mapped the planet and contributed to understand many unsolved issues about Mercury (Solomon et al., 2007). Nevertheless, even after MESSENGER, Mercury surface composition remains still unclear, and the correlation between morphology and compositional heterogeneity is not yet well understood. Thanks to the Mercury Dual Imaging System (MDIS), onboard MESSENGER, a global coverage of Mercury surface with variable spatial resolution has been done. MDIS is equipped with a Narrow Angle Camera (NAC), dedicated to the high-resolution study of the surface morphology and a Wide Angle Camera (WAC) with 12 filters useful to investigate the surface composition (Hawkins et al., 2007). Several works were focused on the different terrains present on Mercury, in particular, Denevi et al. (2013) observes that $\sim$27% of Hermean surface is covered by volcanic origin smooth plains. These plains show differences in composition associated to spectral slope variation. High-reflectance red plains (HRP), with spectral slope greater than the average and low-reflectance blue plains (LBP), with spectral slope lesser than the average has been identified. This spectral variations could be correlated with different chemical composition. The X-Ray Spectrometer (XRS) data show that HRP-type areas are associated with a low-Fe basalt-like composition, while the LBP are also Fe poor but are rich in Mg/Si and Ca/Si and with lower Al/Si and are interpreted as more ultramafic (Nittler et al., 2011; Weider et al., 2012; Denevi at al., 2013, Weider et al., 2014).

In these work we produce high resolution multicolor mosaic to found a possible link between morphology and composition. The spectral properties have been used to define the principal units of Mercury's surface or to characterize other globally distributed distinct spectral units.

Therefore, integrating the spectral variability to a well defined morpho-stratigraphic (photo-interpreted) map will permit to improve the geologic map itself, defining sub-units, and associating spectral properties to analogue deposits.

We are working to produce quadrangles color mosaics and high resolution color mosaics of smaller areas to define color products (common planetary geologic map) and obtain an "advanced" geologic map. The mapping process permits integration of different geological surface information to better understand the planet crust formation and evolution. Merging data from different instruments provides additional information about lithological composition, contributing to the construction of a more complete geological map (e.g., Giacomini et al., 2012). These work has been done in support of the BepiColombo Mission, which has an innovative Spectrometer and Imagers Integrated Observatory SYStem (SIMBIO-SYS). SIMBIO-SYS is composed by three instruments, the visible–near-infrared imaging spectrometer (VIHI), the high-resolution imager (HRIC) and the stereo imaging system (STC) which will be albe to improve the knowledge of Mercury surface form the geological and compositional point of view.

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